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"Implementation on a 3D Image Password"

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Abstract: Development of 3D face model from 2D images has its very important role in many authentication and security related areas. And many organization required a system to measure persons authenticity and get them authority of relevant organization secrete precious data through this authentication. So focusing on two point of maintaining privacy and security of data as well as authenticating user of the data is mainly targeted. So in our development work we have proposed 3D (Three dimensional) image authentication model. In this paper we proposed a 3D images authentication by taking different 2D images from different directions and converting it by using LDA(Linear Discriminant Analysis) and SIFT (Scale Invariant Feature Transforms) algorithms. We are also using OpenCV library function for reorganization of image through android device. After comparing all the images and on the bases of result of comparisons we will give authority to the user to enter into system. This system will definitely give the better result as compare to other in term of security and authentication.

Keyword: Image reorganization, 3D image conversion, OpenCv library, LDA and SIFT.

1. INTRODUCTION

Face recognition is the technique, which can be applied to the wide variety of problems like image and film processing, human computer interaction, criminal identification etc. This has motivated researchers to develop computational models to identify the faces, which are easy and simple to implement.

In biometric system there are different types are techniques and concepts are used for security purpose. In biometric system we use our face, fingerprints, palm, eyes and ears, voices different part of our body for reorganization process and after that give the authentication to user. Some advancement in biometric system there will be a Multi Modal biometric techniques are in front of us with more security and privacy than biometric system. In Multi Modal biometric system we recognized more than one part of human body for verification and identification of the user. And integrating that result of different parts of reorganization process and comparing that resulted output with the database data. If match will found user allow to access or user allow entering into organization. This system restrict the user to illegally use the private most secrete things of someone else.

By these technique many organization has get relaxation from the issue of privacy of the private data or organization. I real world many organization or many application will using this privacy technique for authentication and identification of person. Nevertheless, apart from all these technique the developer never stop at one place for the innovation and making the things more powerful.

Now this is world of smart-phone user with android functionality. People built many apps on the android base. There will be very radical changes over the smart- phone. In

android, there are many apps that provide the authentication through the login and password but the authentication is not so much secure in it. There will be another authentication are available in the android platform. We are also working on this authentication technique but not through voice detection or login details. We are making a use of 3D images for authentication purpose.

We are aiming at this technique with android as a platform because these biometrics and multi Modal biometrics systems are very expensive and not used in a android application. In addition, does not make any sense to use it in any android app. So make available a more security through the android device with a cheap costing and more users friendly and easy to usable application in this world we are proposing this system model.

Here we are proposing an efficient approach for image recognition. To demonstrate the image recognition system in android device by taking multiple 2D images. The system can be used as the base for the development of the recognition of human identity. Test images and training images are taken directly with the camera in android device. The test results will show the system's high accuracy. The goal is to implement eigenface based 3D model for a particular face and distinguish it with input image.

In order to protect any system the User Authentication plays a major role. Image recognition can easily be installed on Android since Android mobile have all embedded hardware like high definition camera for image clicking functionality. However, to have our own algorithm, we have to recreate all the processes from the beginning. Our Approach will describe the way we took to implement as well as possible a new Image recognition algorithm.

As we know, all the android devices have an inbuilt camera with more accuracy in that with pixel quality. So we can suspect a good quality image through this hardware which is already present and we don't have to take more efforts for these problem for good quality image. But the image is taken it the form of 2D image so our main task is to convert that 2D image into 3D (three dimension image). So that purpose we are using two algorithms LDA (linear discriminate analysis) and SIFT (Scale Invariant Feature Transforms). In addition, we are using OpenCV library function, which is a library used for image reorganization purpose and integrate all the algorithms, which we are using in these system development.

The short description is as follows for all the algorithms:

- **LDA (Linear Discriminate Analysis):**

Linear Discriminant Analysis (LDA) most commonly used as dimensionality reduction technique in the pre-processing step for pattern-classification and machine learning applications as we do in the data mining applications. The goal is to project a dataset onto a lower-dimensional space with good class-separability in order avoid over fitting ("annoyance of dimensionality") and reduce computational expenses. It is a classification method formerly developed in 1936 by R. A. Fisher. It is simple, accurately robust and often manufactures models whose exactness is methods that are as good as more multifaceted.

- **SIFT (Scale Invariant Image Transform):**

Harmonizing features by using different images is a common problem in computer visualization. When all images are similar in scenery or nature (same scale, orientation, etc) simple corner detectors can work. However, when you have images of different scales and rotations, you need to use the Scale Invariant Feature Transform. After you run through the algorithm, you will have SIFT features for your image. Track images, identify and recognize objects (which can be partly hidden as well), or whatever you can think of.

- **OpenCV Library:**

OpenCV (Open Source Computer Vision Library) is an open resource computer idea and machine learning software library. OpenCV built to make available a common transportation for computer vision applications and to increase speed the use of machine discernment in the upcoming products. BSD-licensed product, OpenCV makes it easy for businesses to utilize and modify the code.

2. RELATED WORK

For constructing this system application we have search many related working of other developers and grab ideas from there working. However, we are describing some work of others with their system requirements and experimental result.

Juwei Lu, K. N. Plataniotis and A. N. Venetsanopoulos [1] they propose a kernel machine-based discriminant analysis method, which deals with the non-linearity of the face patterns' division. The previous technique also successfully solves the so-called "small sample size" (SSS) problem, which present in most FR (Face reorganization) tasks. The new algorithm has been tested, in terms of classification error rate performance, on the multi-view UMIST face database. Consequences point toward that the proposed methodology is able to achieve outstanding performance with only a very small set of features being used, and its error rate is just about 34% and 48% of those of two other commonly used kernel FR approachs, the kernel-PCA (KPCA) and the generalized discriminant analysis (GDA), correspondingly.

Lin Zhang ,Lida Li, Hongyu Li, and Meng Yang[2] proposing a narrative 3D ear classification proposal that makes use of the label reliable K-SVD (LC-KSVD) framework. As an successful supervised dictionary learning algorithm, LC-KSVD learns a single compressed discriminative dictionary for meager coding and a multi-class linear classifier

concurrently. To use the LC-KSVD framework, one primary issue is how to extract feature vectors from 3D ear scans. To this end, they propose a block wise statistics-based feature extraction scheme. Particularly, they split a 3D ear area of interest into homogeneous blocks and extract a histogram of surface types from each block; histograms from all blocks are then merged to form the preferred feature vector.

Jieping Ye, Ravi Janardan, Qi Li [3] they proposed a orignal LDA algorithm, namely 2DLDA, which stands for **2-D**imensional **L**inear **D**iscriminant **A**nalysis. 2DLDA beats the singularity problem absolutely, while achieving effectiveness. The primary difference between 2DLDA and classical LDA lies in the model for data demonstration. Traditional LDA works with vectorized illustrations of data, while the 2DLDA algorithm works with data in matrix illustration. Further diminish the dimension by 2DLDA, the combination of 2DLDA and classical LDA, namely 2DLDA+LDA, is studied, where LDA is come first by 2DLDA. The previous algorithms are functional on face recognition and compared with PCA+LDA. Experiments show that 2DLDA and 2DLDA+LDA accomplish spirited recognition accuracy, while being much more efficient.

3. PROPOSED METHOD

By study of the related work and there functionality we have decided to develop a system for Android platform. As we know by using, android platform we can built the application for authentication purpose that we want for 3D image authentication. By using android platform there is very simple to design a structure of the application because android support both java and XML features. Through XML, we can design a good eye-catching user interface (UI) and through java we make a connectivity to that UI.

Firstly, we are maintained one database where all user saved data for login or authentication purpose is stored as user identity proof. After that, there will be one login form as if instead of giving user name and password the users have to give the three different images as a test database. These three different images are compared with the image stored in the database. However, before the comparison we have to apply LDA (Linear Discriminant Analysis) and SIFT (Scale Invariant Feature Transform). LDA is techniques for data classification and dimensionality reduction. Linear Discriminant Analysis easily handles the situation where the within-class frequencies are uneven and their performances have been examined on indiscriminately generated test data. This method increases the ratio of between-class inconsistency to the within-class inconsistency in any particular data set thereby assuring maximal separability. SIFT is used for feature extraction process from a different test data. For this two functionality of image recognization, we required OpenCV library function to monitoring the equipment just like mobile camera and coordinating different algorithms.

Below are the brief descriptions of algorithms used in our proposed system work:

1. OpenCv Library:

OpenCV (Open Source Computer Vision Library) is an open resource computer vision and machine learning software library which is available online to any one and in android platform we can use this built in functionality and integrate more than one algorithm. OpenCV was built to provide a common transportation for computer vision applications and to speed up the use of machine observation in the profitable products. The library has more than 2500 optimized algorithms, which comprises a widespread set of both traditional and state-of-the-art computer idea and machine learning algorithms. These algorithms can be used to perceive and recognize faces, identify objects, classify human actions in videos, track camera movements, track moving objects, extract 3D models of objects, produce 3D point clouds from stereo cameras, stitch images together to produce a high resolution image of an entire scene, find similar images from an image database, remove red eyes from images taken using flash, follow eye movements, recognize scenery and establish markers to overlay it with augmented reality, etc.

2. Linear Discriminant Analysis (LDA):

LDA is a technique used for data classification and dimensionality reduction. LDA can efficiently handle the situation where we have to perform classification on within-class uneven data and the data that generated through the randomly generated test data.

DIFFERENT APPROACHES TO LDA:

Data sets can transform and test vectors can be classified in the transformed space by two different approaches.

Class-dependent transformation: This type of approach contains increasing the ratio of between class inconsistencies to within class inconsistency. The main objective is to increase this proportion so that satisfactory class separability is acquired. The class-specific type approach includes using two optimizing criterion for transforming the data sets autonomously.

Class-independent transformation: This approach includes increasing the proportion of in general inconsistency to within class inconsistency. This approach uses only one optimizing criterion to transform the data sets and hence all data points irrespective of their class characteristics are transformed using this transform. In this type of LDA, each class is measured as a split class against all other classes.

MATHEMATICAL OPERATIONS OF LDA:

In this section, the mathematical operations concerned in using LDA will be examined.

i. Devise the data sets and the test sets, which are to be classified in the inventive space.
ii. Compute the mean of each data set and mean of entire data set.
iii. In LDA, within-class and between-class distribute are used to devise criteria for class separability. Within-class scatter is the predictable covariance of each of the classes.
iv. By definition, an eigen vector of a alteration represents a 1-D invariant subspace of the vector space in which the transformation is applied. A set of these eigen vectors whose
v. Corresponding eigen values are non-zero are all linearly autonomous and are invariant under the transformation.
vi. For any *L*-class problem we would always have *L-1* non-zero eigen values.
vii. Once the transformations are finished using the LDA transforms, Euclidean distance or RMS expanse is used to classify data points.

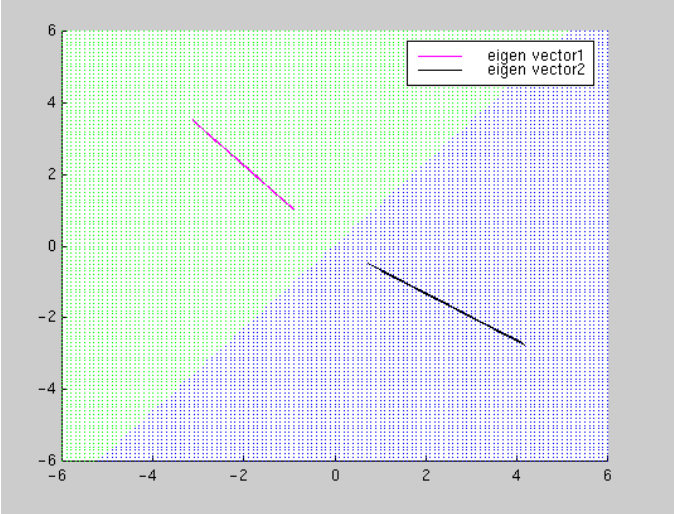


Figure 2. Figure for eigen vector path in class dependent type

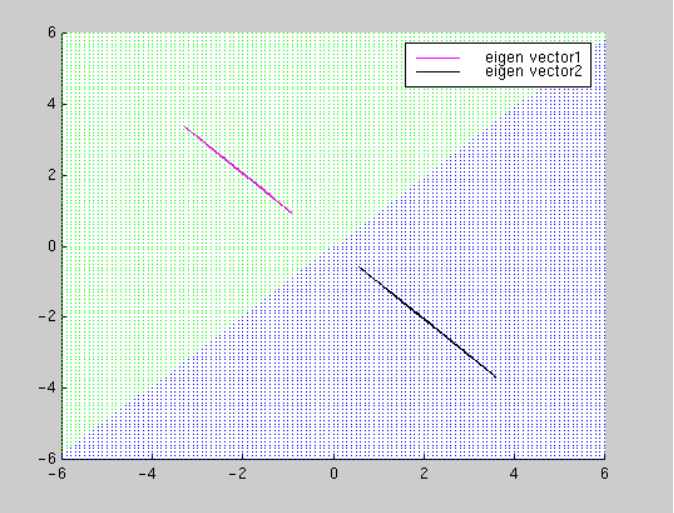


Figure 3. Figure for eigen vector path in class independent type

3. Scale Invariant Image Transform (SIFT):

For any object there are many features, attractive points on the object that can be fetched to provide a "feature" explanation of the object. This explanation can then be used when required to position the object in an image including many other objects. SIFT image features present a set of features or characteristics of an object that are not exaggerated by many of the difficulties experienced in other methods, such as object scaling and rotation.

The SIFT approach, for image feature production, takes an image and convert it into a "large collected works of local feature vectors".

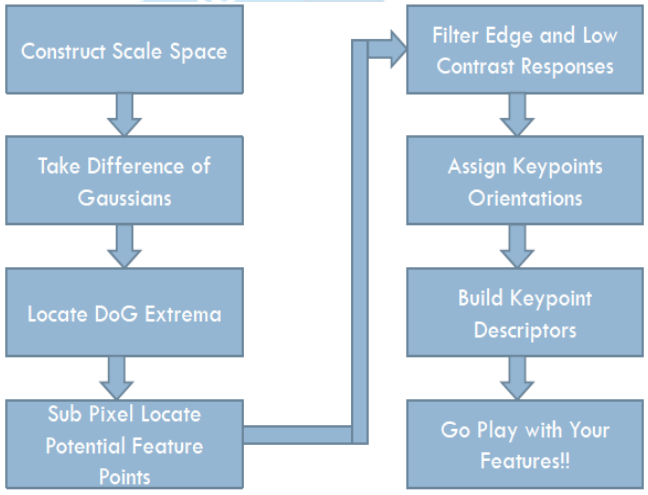


Fig.3. Flowchart of overview of SIFT

i. Constructing Scale Space: Gaussian kernel used to create scale space.
Only possible scale space kernel

$$L(x, y, \sigma) = G(x, y, \sigma) * I(x, y),$$

Where

$$G(x, y, \sigma) = \frac{1}{2\pi\sigma^2} e^{-(x^2+y^2)/2\sigma^2}.$$

ii. Laplacian of Gaussians:
LoG - σ2Δ2G Extrema Useful, Found to be stable features. Gives Excellent notion of scale

iii. Difference of Gaussian:
Approximation of Laplacian of Gaussians

$$\sigma\nabla^2 G = \frac{\partial G}{\partial \sigma} \approx \frac{G(x, y, k\sigma) - G(x, y, \sigma)}{k\sigma - \sigma}$$

$$G(x, y, k\sigma) - G(x, y, \sigma) \approx (k - 1)\sigma^2\nabla^2 G.$$

$$\begin{aligned} D(x, y, \sigma) &= (G(x, y, k\sigma) - G(x, y, \sigma)) * I(x, y) \\ &= L(x, y, k\sigma) - L(x, y, \sigma). \end{aligned} \quad (1)$$

iv. Locate the Extrema of the DoG:
1. Scan each DOG image
2. Look at all neighboring points (including scale)

3. Identify Min and Max
4. 26 Comparisons

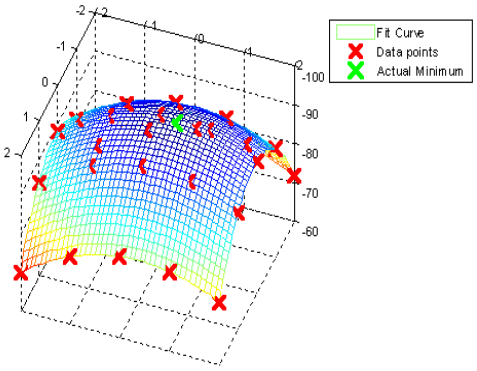
v. Sub-pixel Localization:
3D Curve Fitting, Taylor Series Expansion

$$D(\mathbf{x}) = D + \frac{\partial D}{\partial \mathbf{x}}^T \mathbf{x} + \frac{1}{2}\mathbf{x}^T \frac{\partial^2 D}{\partial \mathbf{x}^2}\mathbf{x}$$

Differentiate and set to 0

$$\hat{\mathbf{x}} = -\frac{\partial^2 D}{\partial \mathbf{x}^2}^{-1} \frac{\partial D}{\partial \mathbf{x}}.$$

to get location in terms of (x,y,σ)



vi. Filter Low Contrast Points:
Low Contrast Points Filter

- Use Scale Space value at previously found location

$$D(\hat{\mathbf{x}}) = D + \frac{1}{2}\frac{\partial D}{\partial \mathbf{x}}^T \hat{\mathbf{x}}.$$

vii. Orientation Assignment:
A. Compute Gradient for each blurred image
B. For region around keypoint

- Create Histogram with 36 bins for orientation
- Weight each point with Gaussian window of 1.5σ
- Create keypointfor all peaks with value>=.8 max bin
- Note that a parabola is fit to better locate each max (least squares)

viii. Building the Descriptor

- Find the blurred image of closest scale.
- Sample the points around the keypoint.
- Rotate the gradients and coordinates by the previously computer orientation.
- Separate the region in to sub regions.
- Create histogram for each sub region with 8 bins.

a. Weight the samples with N(σ) = 1.5 Region width
b. Trilinear Interpolation (1-d factor) to place in histogram bins

4. CONCLUSIONS

As we discussed in this paper about Implementation 3D Image Authentication Technique for authentication. By using Android platform and OpenCV library function we make our work easier as compare to others for algorithmic purpose. Then after decided to use LDA and SIFT for classification and image feature extraction process. And as a result we have

obtained a better outcome than other technique in more efficient and easy to handle with great user interface.

5. REFERENCES

[1] Juwei Lu, K. N. Plataniotis and A. N. Venetsanopoulos, "Face recognition using kernel direct discriminant analysis algorithms," in *IEEE Transactions on Neural Networks*, vol. 14, no. 1, pp. 117-126, Jan 2003.

[2] Lin Zhang ,Lida Li, Hongyu Li, and Meng Yang, "Two-Dimensional Linear Discriminant Analysis".

[3] Benz, M., Laboureux, X., Maier, T., Nkenke, E., Seeger, S., Neukam, F., Häusler, G.: The symmetry of faces. In: Proceedings of Vision, Modeling and Visualization, pp. 43–50 (2002)

[4] Besl, P., McKay, N.: A method for registration of 3-D shapes. IEEE Trans. Pattern Anal. Mach. Intell. **14**(2), 239–256 (1992)Google Scholar

[5] Beumier, C., Acheroy, M.: Automatic 3D face authentication. Image Vis. Comput. **18**(4), 315–321 (2000)Google Scholar

[6] Beumier, C., Acheroy, M.: Automatic face verification from 3D and grey level clues. Pattern Recog. Lett. **22**(12), 1321–1329 (2001)Google Scholar

[7] Blanz, V., Vetter, T.: Face recognition based on fitting a 3D morphable model. IEEE Trans. Pattern Anal. Mach. Intell. **25**(9), 1063–1074 (2003)Google Scholar

[8] Bowyer, K., Chang, K., Flynn, P.: A survey of 3D and multi-modal 3D+2D face recognition. Notre Dame CSE Technical Report (2004)

[9] Bronstein, A., Bronstein, M., Kimmel, R.: Expression invariant 3D face recognition. In: Proceedings of the International Conference on Audio and Video Based Biomeasure Person Authentication, pp. 62–70 (2003)

[10] Cartoux, J., Lapreste, J., Richetin, M.: Face authentification or recognition by profile extraction from range images. In: IEEE Computer Society Workshop on Interpretation of 3D Scenes, pp. 194–199 (1989)

[11] Chang, K., Bowyer, K., Flynn, P.: Face recognition using 2D and 3D facial data. In: Proceedings of the Workshop in Multimodal User Authentication, pp. 25–32 (2003)

[12] Chua, C., Han, F., Ho, Y.: 3D human face recognition using point signature. In: Proceedings of the 4th IEEE International Conference on Automatic Face and Gesture Recognition, p. 233 (2000)

[13] Hallinan, P., Gorden, G., Yuille, A., Giblin, P., Mumford, D.: Two and three-dimensional patterns of the face. Peters, Wellesley, MA (1999).

[14] Hamann, B.: Curvature approximation for triangulated surfaces. In: Farin, G., Hagen, H., Notemeier, H., Knodel, W. (eds.) Geometric Modelling. Springer, Berlin Heidelberg New York, pp. 139–153 (1993)

[15] Kazhdan, M., Chazelle, B., Dobkin, D., Funkhouser, T., Rusinkiewicz, S.: A reflective symmetry descriptor for 3D models. Algorithmica **38**(1), 201–225 (2003)Google Scholar

[16] Lee, M., Ranganath, S.: Pose-invariant face recognition using a 3D deformable model. Pattern Recog. **36**(8), 1835–1846 (2003)Google Scholar

[17] Liu, Y., Schmidt, K., Cohn, J., Weaver, R.: Facial asymmetry quantification for expression invariant human identification. Comput. Vis. Image Understand. **91**(1–2), 138–159 (2003)Google Scholar

[18] Minovic, P., Ishikawa, S., Kato, K.: Three-dimensional symmetry measurement of medical entities. In: Proceedings of the 11th International Conference on Pattern Recognition: Conference A: Computer Vision and Applications, pp. 457–460 (1992)

[19] Moreno, A., Sánchez, Á., Vélez, J., Díaz, F.: Face recognition using 3D surface-extracted descriptors. In: Proceedings of the 7th Irish Conference on Machine Vision and Image Processing, Antrim, N. Ireland (2003)

[20] O'Mara, D., Owens, R.: Measuring bilateral symmetry in three dimensional magnetic resonance images. In: Attikiouzel, Y. (ed.) 1996 IEEE Region Ten Conference: Digital Signal Processing Applications, IEEE Service Center, pp. 151–156 (1996)

[21] Reisfeld, D., Wolfson, H., Yeshurun, Y.: Detection of interest points using symmetry. In: Proceedings of the International Conference on Computer Vision, pp. 62–65 (1990)

[22] Turk, M., Pentland, A.: Face recognition using eigenfaces. In: Proceedings of the Conference on Computer Vision and Pattern Recognition, pp. 586–591 (1991)

[23] Tuzikov, A., Colliot, O., Bloch, I.: Brain symmetry plane computation in MR images using inertia axes and optimization. In: Proceedings of the International Conference on Pattern Recognition, pp. 516–519 (2002)